

# AVIATION WEEK

Exclusive Report . . . .

AIRLINE EQUIPMENT OVERHAUL TIME

APR. 23, 1951

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## This PANTHER has sharper claws!

Latest modification of the GRUMMAN PANTHER, the F9F-5, is more powerful, aerodynamically cleaner, faster, and reaches higher altitudes than its predecessors. First jet aircraft used by the Navy in combat, the PANTHER is currently flown from carrier bases by Navy pilots and from Korean fields by pilots of the United States Marine Corps.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, N.Y.

Contractors to the Armed Forces

## Power-absorbing "load bank" verifies performance of Sundstrand alternator drive



**Load bank duplicates characteristics of all control functions on the B-36**

Compactly housed in this steel cabinet is one of the world's largest "load banks" ... developed by Sundstrand specifically for testing constant speed alternator drives used on the B-36. Drives can be tested simultaneously, and in parallel, at speeds duplicating those of the engines on a B-36 from take-off to landing. Characteristics of all the control functions on the plane are present. This same type of load bank will be used for testing and run-in purposes on Sundstrand constant speed alternator drives for transports, bombers and fighters. It is typical of Sundstrand's facilities for reliable research, expert engineering and precise production of specialized aerospace hydraulic products.



### SUNDSTRAND HYDRAULICS

SUNDSTRAND MACHINE TOOL CO.  
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, PUMPS, MOTORS, AND VALVES • DE BURBIS PUMPS • AIR SAMPLERS  
LATHES, MILLING, GRINDING AND SPECIAL MACHINES • ROTATING TOOLS • MAGNETIC COUPLERS

## B.F. Goodrich



## Open and shut case for B. F. Goodrich zippers

**Slaps up terror of heat.** Designers wanted to make the heat air duct in the Douglas C-124 (top left above) in 6 foot sections. They needed a strong, flexible coupling that would permit easy removal of the sections. B. F. Goodrich Pressure Sealing Zippers proved ideal. They provide a 100% seal, resist the heat, resist damage, speed maintenance.

**Sealed lips hold secret of faster maintenance.** Flip seals that join afloat and wing joined a maintenance problem on the B-36 (top right above). Tearing of the afloat caused removal of hundreds of screws fastening the 60-foot seal. Convex engines and joining a B. F. Goodrich Pressure Seal-

ing Zipper down the middle of the seal. Result: the zipper's overlapping lips keep a tight seal. And mechanics can simply zip the seal off.

**Keeps fumes from bothering plane's crew.** The Lockheed Neptune's problem was to keep fuel fumes from the bomb bay out of the forward compartment—you keep a steady connection between the two BFG zippers built a mechanical camera. A Pressure Sealing Zipper runs all the way around the edge, making the cabin airtight and also easily unsealable. (Bottom left above)

**60" long holds 12-man boat, weighs 3000 lb in seconds.** The Coast Guard needed a stronger case for inflatable life

rafts. A case that would seal out the water and only be easily opened and open quickly. BFG engineers designed a case with a Pressure Sealing Zipper running all the way around and an unsealable lock. (Bottom right above) The case is water tight. It unseals automatically in the boat inflates. The unsealing operation can be handled by one man. If you have a problem due a zipper cable valve, check out B. F. Goodrich Pressure Sealing Zippers. The B. F. Goodrich Company, Akron, Ohio

**B.F. Goodrich**  
FIRST IN RUBBER





Forgings for the aircraft industry today demand the utmost in engineering and production techniques and in scientific laboratory control. This massive complicated landing gear component, weighing over 400 pounds, is typical of Wyman-Gordon's forging contribution to the ever-growing progress in aircraft design. In crankshafts for the automotive industry and in all types of aircraft forgings, steel and light alloy, Wyman-Gordon has pioneered in the development of forging "know-how"—there is no substitute for Wyman-Gordon experience.

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**WYMAN-GORDON**  
FORGINGS OF ALUMINUM • MAGNESIUM • STEEL  
WORCESTER, MASSACHUSETTS  
HARVEY, ILLINOIS DETROIT, MICHIGAN

## NEWS DIGEST

### DOMESTIC

A. P. Fontaine has been elected a vice president and general manager of Cessna. A veteran of 21 years experience in aviation, Fontaine returns to the company where he held several executive management positions between 1929-1943. President L. M. T. Cobb said he had the idea of general manager.

Pinetree H-35 in the Army designation of the HUP-1 helicopter which was being purchased for service in the Transportation Corps out of fiscal 1951 funds.

Two XR50-1 Chautauque transport will continue in operation under a new grant of funds for spare, engine overhaul and 1700-hr. heavy maintenance, thus providing their continued use in fleet logistics units between California and Hawaii and the West Coast and Washington, D. C. Official Navy estimate was made on the trouble-free 8000-hr. operation of the two 150-passenger Lockheed planes, and Navy has the transport will be kept in service for their second life.

Materials allocations for new-series and plane manufacturers seemed assured to permit each company to produce in five months of its 1950 rate. This would mean output of approximately 1500 planes a year. CAA and Air Coordinating Committee have already approved this rate and Defense Production Administration was expected to give it the go-ahead last week.

Senators have confirmed the nomination of Delos Russell as Undersecretary of Commerce for Transportation. Donald Syme is a member of Civil Aeronautics Board and Charles H. Hays is Civil Aeronautics Administrator. The President is expected to designate Syme as CAB chairman, succeeding Board.

Consolidated Value Aircraft is negotiating with Navy for construction of a public works plant at Pensacola, Fla., for production of the aircraft in 1950. It is a rocket-propelled, subsonic, four-engine.

National Foreign Interchange between New York and South American points (American White Air) was tentatively approved by CAB and set off a chain of objections. The FAA decision on Foreign did likewise. FAA's big point is controls Foreign plans between Dallas and Miami because of the recent's past "blackout" agreement and this is a second change there places in National, and CAB has no

right to enforce such a change. W. B. Green & Co., built a lot of aircraft, claims it has the legal right to change places in National.

### FINANCIAL

Consolidated Value Aircraft Corp. has reported a profit of \$1,415,550 for the first quarter ended Feb. 28, before provision for federal income taxes for the period was \$68,812,990. A dividend of 15 cents per share was declared, payable May 25 to stockholders of May 15.

Boeing Aircraft Corp. has voted a 10% quarterly dividend of 20 cents per share to stockholders of record Apr. 25, payable May 4.

Boeing Aircraft building Apr. 1 is \$708,512,864, highest since World War II's end. First quarter sales of \$38,348,399 are 10 percent over a year ago. Net earnings of \$1,601,351 or \$2.80 a share are up 10 percent. Some 13 percent of the Apr. 1 backlog is commercial orders for 52 DC-6Bs. Of the military backlog, 734 percent is Navy, 465 percent is Air Force.

Pacific Airline Corp. reports first-quarter sales of \$4,370,000—61.6 percent ahead of the same period in 1950. Current backlog contracts over 50 million, with the Minneapolis division's backlog being over \$2 million.

### INTERNATIONAL

Senators A. Lee and D.C. rushed at sea to the vicinity of Cape d'Agulhas (near Hong Kong) with various aircraft. At present, no wreckage or any survivors had been sighted.

William G. A. Fergus, director of the Royal Aircraft Establishment, Farnborough, England, near 1946, died at the age of 52. He joined the Farnborough staff in 1921.

Canada will spend about \$700 million in the U. S. as defense aid in fiscal 1951-52 according to Canadian Defense Minister Brooke Claxton. Most of the money will be for engines and components for the Canadian-built F-86 and for the Agave and Air Force equipment to replace stocks sent to Western Europe.

Canadian government has placed orders for 5207 aircraft worth of Army Canada CF-100 and Canada F-86D jet fighters, and for manufacturing a "considerable quantity" of World War II aircraft engines.

### THE STRONGEST,

### SIMPLEST,

### LIGHTEST

### SYSTEM OF

### TRIM TAB

### CONTROL



Although TrimTab weighs only 31½ pounds, it has an ultimate static capacity exceeding 1,500 work-pounds, and produces 750 work-pounds operating torque through 100° rotation.

TrimTab incorporates zero backlash output, 36 volt dc operation, steel reversible motor, magnetic brake, built-in extremely adjustable limit switches, externally adjustable position transmitters, built-in radio noise filter. Airborne's TrimTab units can be used in applications from many TrimTab's. Airborne permits "locking" the output without, however, the elimination of position indicators.

Offered in two models, differing in mounting arrangement, but identical in performance. Both meet the requirements of Specification AD-M-49, AAF 41351, JIN T8895-1.



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ACCESSORIES CORPORATION

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REGISTERED: SHIPPING INDEX, 1948-1950, 1951



# For more than 20 years leading U.S. planes have used MACWHYTE AIRCRAFT CABLE

Building hundreds of millions  
of feet of cable gives the  
"know-how" needed  
for better service

The skilled craftsmen who have made hundreds of millions of feet of Macwhyte "Hi-Fatigue" Aircraft Cable are experienced in every phase of its manufacture...in ground wire engineering...in metallurgy...in precision fabrication.

Macwhyte "Hi-Fatigue" Aircraft Cable has numerous uniform strands. And being properly PRESTRESSED, it lays down with no tendency to twist or curl. When properly cut, there is no tendency for wires or strands to untwist or move out of position. It is preferred by rigging departments...the men who must handle and splice cable assemblies and install them. It is used by leading aircraft manufacturers and airlines.

Controls made with Macwhyte reliable "Hi-Fatigue" Aircraft Cable and "Safe-Lock" winged terminals are used for their superior quality to resist wear, and loading fatigue. Maximum efficiency, long life, and greatly reduced maintenance save time and money.

Catalog and literature is available on request.



Macwhyte "Hi-Fatigue" Aircraft Cable is supplied in reel bins, specified lengths, and cable assemblies. Macwhyte "Safe-Lock" and "Safe-Tight" terminals are supplied loose or attached to cable.

## MACWHYTE COMPANY

3922 Fourteenth Avenue, Kenosha, Wisconsin, Manufacturers of "Hi-Fatigue" Aircraft Cable, "Safe-Lock" Cable Terminals, Cable Assemblies, Tie Rods, Braided Wire Rope Slings, Bright, Galvanized, Stainless Steel and Metal Wire Rope.



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"Hi-Fatigue" is a registered trademark.

100-4

## WHO'S WHERE

### In the Front Office

Alan G. Bessie has been appointed vice president of National Investment Corporation of Standard Oil Products Co. As regional, Bessie has been assigned general manager at Milwaukee for the past five years, prior to that was manager of the sales and service engineering department.

Edward R. Foster has been made a vice president of United Nations Corp., also a member of the firm's administration committee. He will continue to be general manager of the company's radio communications division, Baltimore. Foster joined the company in 1936.

Robert E. Johnson has been named vice president and assistant to the president of United Air Lines. Johnson, who has been with UAL for 17 years, has been and will continue to be responsible for public relations, advertising and publicists.

Charles E. Rogers has been appointed assistant to Vice Adm. Frank B. Lord, new chief of the Air Transport Army. Rogers continues his duties as director of ATN's public affairs department.

### What They're Doing

Andrew A. Maysie formerly vice president and chief engineer of Western Aircraft Corp. has joined Aeroquip, Inc. to work in the field of hydraulic and precision metal parts and joints. Maysie is president and chief engineer of the new company, which is located at 11414 Kluge Avenue, Chicago 12.

Rogues Selby, who has been described as "one of the men who led the foundation" for the new airline in the U. S., has retired from CNA at the age of 66. Selby has been in government service for more than 30 years, his first position being with the Post Office Department. He transferred to the IRS as assistant Commissioner. Recently of the Department of Commerce in 1935.

### Changes

Steve H. Reynolds has joined Bell Aircraft Corp. in technical capacity and Herbert A. Chester has joined the firm as electronic engineer to lead up to jet propulsion.

Robert A. Wolf has resigned as general chief of preliminary design of Bell Aircraft to become principal engineer in General Atomics' Lab's special projects department to handle operational analysis and systems evaluation.

Paul Brown has been made director of sales for the Tucker Keller Boeing Co.

Richard M. Morgan has been appointed general manager of Boeing Aircraft's newly formed service organization, Inc. in the West Coast division. John E. Schindler is new public relations director for Central Airlines.

## INDUSTRY OBSERVER

Several top operating people at ANAC finally reevaluation plans over what a profit when they awarded contracts in a basic period from the Contract Materials Plan for scheduling critical materials. These ANAC people are management should be listed along with aluminum, copper and steel, and they are push for revision of CMSP, to include it as a primary metal.

After long delay Curtiss-Wright hopes to deliver a two-cylinder rocket engine to Bell Aircraft for X-2 program. That is undergoing static test at the Wright plant and at Lakehurst, N. J., Rocket Engine Facility. The engine is said to deliver approximately 15,000 lb. thrust.

USAF Senior Officers Board is in session to determine extent of six-phase plan of the 1954 aircraft intercept competition (Aviation Week Jan. 15). Hughes Aircraft was the first phase for design of the electronic guidance system. Military sources have indicated that some of the aircraft concepts are completely unsuccessful in comparison to present advance configuration. Industry engineers and some military quarters predict that several two experimental models will go to North American Aviation. Plans will cover a pilot aircraft, to be completely automatic, capable of near speed, and able to knock down an enemy bomber at 60,000 ft. It will carry one air-to-air guided missile.

Goodrich has completed 95 percent of an ANAC project for development of a flexible tapered aluminum leading wheel design for heavy transport. The new wheels are expected to last a life ten times that of existing wheels.

Bell Aircraft is about to complete the first of an experimental USAF order of jettable aluminum wingtip tanks. They will be evaluated against aluminum tanks. Project is an extension of a trend to replace more critical aluminum with magnesium in aircraft components.

Reynolds Metal's experimental program to extrude aluminum cylinders—16 inch wide extruding dies—which can be cut and straightened into a ribbed aluminum sheet has encountered a problem, in the form of a bending which appears on the smooth side of the sheet at each end when the extrusion is straightened. Further tests are being made to eliminate the kinks. Meanwhile Reynolds has produced interesting samples of rolled tapered aluminum sheet of aircraft size and quality, including tapered tapered sheet, and is continuing development on this project, started by the USAF in 1948.

Virtually every major jet engine in the USAF procurement program is in the process of a component redesign study for elimination of critical materials and for improved producibility in large quantities.

Strategic Air Command headquarters requirements at Omaha are expected to keep the Big Mites Nebraska plant busy. It doesn't figure in the present phase of plant expansion to manufacturing. All the present size of aircraft at machine tools from storage, the Omaha plant may be closed in about six months and then SAC is likely to take it over completely, as Air Materiel Command did with the Glendale City Douglas plant of World War II.

One light house experimental approach to the critical problem of making electronic tubes more reliable (Aviation Week Apr. 9) is being investigated for the USAF by two competing manufacturers. The development is remote power tubes that will operate at a higher temperature and be more resistant to breakage than glass tubes now in use.

Shorter completion of pilot engine have just about written their off as far as future Air Force planning is concerned, with the possible exception of helicopter engines. And even here common sense is to be that anything the pilot can do, a transport can do faster and better, once it gets started.

## Washington Roundup

### MacArthur on Air Power

"Even before General Douglas MacArthur was to speak before Congress last week, Washington observers felt he would take up the issue of air power, the cause of wartime 'Bully' Mitchell whom Mitchell left at it, with his death a decade and a half ago. In his closing days, Mitchell (pictured that MacArthur's wife) was for an air service co-equal with the ground and naval services.

MacArthur's flight will be for a dominant air force—a "first line of defense" supported by ground and sea forces in auxiliary roles.

Members of Congress and top military officers, who have conferred privately with the Soviet general, say it is "certain" that he will march into the role of commanding successor to Mitchell.

MacArthur supporters claim they have documentary evidence showing that he vigorously opposed the transfer of the 1915 coast guard which suspended Mitchell from the Army for five years.

If he did, Mitchell apparently never knew it. But he was sure that MacArthur sympathized with his position, which he made in 1915, shortly before his death.

"A number of the men who converted me will be called upon again to guide this action as a second world war is in all probability. I hope they will take additional advice I had to say."

Despite MacArthur, it is believed, will be the first to admit that I was right when the war was over. He insists that part played in my own career. My life has been enough to me to say.

Elements have long suspected that the belated Hoover-Tell Wherry advocates of air power are advancing, parallel with public by military means, of a MacArthur move plan for U.S. defense.

Former politician Thaddeus W. Wherry, the second oldest, have tried defense to risk politics. The result: a second world war. Both supported the Truman-Johnson shift-back to the 1930s Air Force program, to promote economy. Their recent advocacy of air power has been largely written off in Washington as mere posturing.

But most military men see MacArthur can be counted on to lead his defense policy first. On the side, Democrats, as well as Republicans, are ready to listen attentively to what he has to say.

Those who have talked with him are MacArthur's defense concept outlining about build-up of strategic air power is this:

"The U. S. must make its defense to meet the challenge of a direct war with Russia—draw a decisive line, decided appearance, if and when Russia comes the line, squarely meet the challenge."

"The Administration's policy of Russia 'containment' through an air force of land-based 'pocket aircraft' throughout the world will dilute the U. S. strength to meet the prime challenge."

"Under the first case, the U. S. would declare an air force, the field where it is superior, then giving promise of victory."

"Under the second case, Russia is declaring conflict land warfare, probably will declare a hopeless ground war to hold Europe against its aggression. Against the main axis the Russian controls in air, land, and air, and the Far East, the ground forces of the U. S., plus all

the Allied support it might muster, can seem hope to win. The first clause of Mitchell have down up their strategic concept, emphasizing build-up of the Army for "containment," to fit the Administration course. USAF's Chief of Staff has unambiguously endorsed it—so far.

### Plane Contracting Delay

Outlook in that several months will pass before Air Force and Navy can confirm "letters of intent" with contractors for aircraft and engines.

The service started dispatching the letters shortly after the declaration of a "national emergency" last November. They didn't have funds to back them up, but anticipated them soon. They wanted to let manufacturers know what their requirements would be, so they could plan. The Administration and Congress were busy to approve properly funds for a quick defense build-up.

"After that emergency mood got by, the project went on. Air Force and Navy will get a 'hard amount' for plane and engine purchases when Congress approves a pending supplemental appropriations bill for this year, probably in a few weeks.

"Ready for aircraft purchases in the 1952 fiscal year won't be available before July. Probably they will be tied up in Congress long after that date."

House Appropriations Committee members are demanding a "complete shuffling list" of the military program which will probably total around \$70 billion, for "thorough" review.

Added to that indication of delay, Republican senators are preparing for a war battle to divert Army funds into the Air Force for a build-up of the strategic air arm.

### Here and There

Industrial Mobilization. Defense Minister Charles E. Wilson's plan for a one-half military industrial capacity that could triple production by going to three shifts at the peak of a battle has been modified. The plan now is for expansion to two-shift capacity that could rapidly increase production by going to three shifts in an emergency.

CAB Investigation. Sen. Charles McNichols has asked for a full fact review. The apparent was shown back in 1946 during testimony at the investigation of William Pittman for Un-Americanism of Navy. On the basis of evidence disclosed then, Tobey charged the former Democratic National Committee Treasurer George Kilgus, and the front of account of a CAB candidate in United Auto Law for a Detroit-Los Angeles route in an effort to obtain a political campaign contribution from UAL. President William Pittman. Pittman was to make no contribution to UAL. UAL did not get the route. Tobey will have opportunity now as a member of the Senate Small Business Committee, studying the charge of un-Americanism that the board is controlled by the scheduled industry.

Neutralized Regulations. Officials are ready to review and that they be confined to "actual duty" service representing the first day service of scheduled airlines. But they will fight to the end against any limitation on nonstop service. As long as they are allowed a different type service, that is, it won't drive away traffic from the scheduled airlines, no matter how rapidly they operate between points. More likely, they will try to restrict the less income traffic of rail and bus.

—Katharine Johnson

# AVIATION WEEK

VOL. 34, NO. 17

APRIL 23, 1951

## Relief Speeded for Material-Short Plants

- Aircraft Production Resources Agency already set up and functioning for military contractors.
- Shortly, you will have to file your requirements, and then allocations will start about July 1.
- But a steady flow of materials into aircraft plants probably cannot begin much before September.

By Alexander McFarland

Dayton—How much aluminum, copper and steel will U. S. air power need? And how much will it get?

Answers to these two questions aren't easy.

But the job of getting the answer together has been started here at Wright-Patterson AFB, by a team of old Bureau heads representing Air Force, Navy and Army, and a staff of military aviation industry planners.

President—They may find encouragement in the knowledge that essentially the same job is being done elsewhere on other fronts. That was in World War II when a tough organization called Aircraft Allocation Unit made a list of key, hard-to-get products necessary to strengthen out the military production for the aircraft industry. ASD eventually dropped as a list of ten, but it did not get off enough so that the U. S. industry had the general military and naval air force that the world has ever known.

Now the mission to ASD, a similar group with a few changes dictated by World War II experience, is getting set for a similar job.

This time, Department of Defense and its top planning agency, the MacArthur Board, are calling the new effort along with AFPA. The four letters stand for Aircraft Production Resources Agency.

Until April 15, when MacArthur Board, AFPA Administrator, discussed the Aircraft Control Materials Plan at Washington, the new AFPA organization was only potentially a housewife's outfit. A big part of its job's time was taken up with day-to-day trouble-shooting and expediting on materials and other industrial concerns. And some of it was quite effective, too. But it was in a subsidiary base without any set ground rules to go by.

Now CMP provides the ground rules—very similar, overall, to the Controlled Materials Plan of World War II.

AFPA's Task—AFPA stands for the U. S. Government's central agency for the Air Force and the Navy Bureau of Aeronautics in applying for controlled materials jobs at meeting conflicting requirements, if and when they arise, between the services, will be the suggestion of the three AFPA members: Col George Schneider, Air Force, who was elected chief director, Capt. Roy Jackson, Navy, and Col Robert R. Clark, Army. The agency director will be elected monthly from the three service representatives.

To take care of material shortages and plane production scheduling for which and other civil plants, Civil Aeronautics Administration is leading Col David L. AFPA. He will receive detailed lists of requirements from the CAA Office of Aviation Demand Requirements in Washington.

David's job will be to integrate and coordinate needs with military schedules, and to amend the authority of the organization of civil aviation to a ready scale source.

Lead Time—As he is the aircraft industry is concerned, AFPA planners expect that it will be from three to five months before the new effort date (Apr. 15) before materials flow will come from the mill.

Schneider says that it takes about 75-100 days for the mill, and at alloy steel, 10-15 days for the mill, and 15-20 days for copper and 45-60 days for aluminum as an average. And the new effort will be started only preliminary procedure of determining materials as quantities and allocations has been handled.

NPA has announced that statement of specific amounts of materials to producers will start July 1. This coincides with the AFPA planning timetable. But the distribution of aircraft materials will be delayed until September or possibly October, when the flow of materials will be flowing from the mills under the new schedule.

The NPA announcement and that manufacturers of military products, products in the Atomic Energy Commission, and certain defense-related construction projects would be required to file their detailed requirements as late as possible, but not later than May 1 through the Department of Commerce and its field offices, national stock associations, and similar groups.

NPA Products List—NPA list of products for which application forms will be required includes such items as aircraft and aircraft parts, machine tools, metal-working machinery and equipment, including welding and cutting apparatus, metal shipping containers, electrical wiring, dunnage and supplies, electrical welding and measuring instruments, electrical accessories, and other electronic equipment, glass, plastic, radio and television equipment, radio tubes, tires and inner tubes, aircraft instruments, optical goods, photographic equipment, repair and maintenance equipment.

Concentrations—Products whose manufacture will come under the plan are in two categories.

"A" Products—Including most defense production, classified in those in which the most common method of production rationing and materials allocation is verified in other words, in which the civilian sector gets its share of materials and equipment from the government agency that was his "customer," the subcontractor would rely in turn upon the prime contractor, the subcontractor on the subcontractor, etc.

"B" Products—Defined in those for which rationing can be handled horizontally directly to the producers, including certain civilian equipment, control machinery and equipment and some components needed for defense. Producers of B items will receive no rationing and allocations from NPA's materials delivery.

Once Controlled Materials Plan gets









"BUCK PRIVATE" American Helicopter Co.'s one-place pilot's cockpit, and .



"HELIDEEP" at Rotec-Craft Corp. shows the safety of West Coast helicopter designs.

## Two New Copters Offered Military

Two new West Coast helicopter manufacturers have announced their plans for small rotary-wing craft, based on the basis of Heller's Hasegawa and McCulloch's MC-4. (Aviation Week Feb. 19, p. 23; Mar. 30, p. 10).

They are American Helicopter Co., Menasha, Wis., and Rotec-Craft Corp., Glendale. They are both licensing their craft for military use and holding back most of the details, but they also admit, under American Helicopter's product is a single place pilot's cockpit that is being. Rotec-Craft's is a design proposal for a two-place rotorcraft.

American Helicopter's SA-6 "Buck Private" is the smallest, single-seat rotorcraft by the firm. The firm, the SA-7 "Tiger" is a two-place craft that first flew in January, 1969. The SA-6 has an empty weight of about 200 lb., and is about as simple as you

can get a helicopter, merely a single formed aluminum tube with a seat and small bicycle landing gear. It has an endurance of about one and one-half hours without refueling.

Rotec-Craft Corp.'s "Helidrop" is planned to be about 25 ft. long, with doors about seven ft. wide to allow moderate stretch. Powerplant is to be a single 275-hp engine laterally mounted with transmission shafts running under the floor. The craft is designed for a speed of approximately 100 mph, maximum range of 700-100 miles, and useful load of 1500 lb.

Other manufacturers are expected to join the competition to supply the Armed Forces with rotary-winged craft. Since use of the craft is becoming more widespread on the basis of its success in Korea operations, defense officials will probably call for a larger role for the helicopter in their future mechanization plans.

## SIDELIGHTS

(Continued from page 6)

son office at ANTC, is going with Hughes Aircraft as primary and public relations director at the new Hughes missile plant in Arizona. Marty Lohrman, son of the late George Lohrman, was succeeded by father as Dallas representative for Fairchild Engine & Airplane Corp.

### M475

Walter Air Transport Service at Andrews AFB, Washington, D. C., uses the world-wide service world machine requirements, construction, general mechanical, electrical, heating air conditioning, rebuilding, refrigeration and aviation. Starting salary was \$1400 to \$1450.

### Army

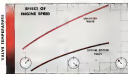
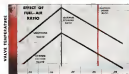
Two of four of the Canadian L-26 Beaver light transport recently purchased are on bid at Ft. Belvoir, Airborne Center. AF has, plus additional L-26s to be bought will be used for light cargo transport. Negotiations between Army, USAF and Rockwell Aircraft Corp. for purchase of four Twin Otter transport aircraft. Purchase will be made out of the fiscal year 1970 funds. A 2000 B. Bids are at Ft. Monmouth, Va., Army Field Forces HQ is working completion.

### Air Force

USAF is conducting a complete "national audit" of the Pentagon. Almost in partial operation, it will be more central of all USAF operations. AF has decided to of Boeing, Mo., enter bids to DoD AF's interest of several military aircraft, but are scheduled to be continued for the time being. Air Force now has an offer to buy the AF's role on a dark blue background with a shrouded and dark of lightning, a shield and a circle of 13 stars. General AF's, S. C. is received. Headquarters AF's is John G. Davidson, of World War II.

### Industry

Conover wants to call its new Children's plant the "American Dream" but now may not OK that new word, could be "American Dream." General Industries Inc. reports expenditures in connection with legislative activities of \$20,000 for 1970 in its report to the Chair of the House under the Legislative Act. Forth & Whitney is following the same policy of housing agreements with some manufacturers in doing World War II era results in payments after their retirement. Boeing is still holding approximately of 1400 status. Later in a hearing by SLAG, scheduled for May 1, as it completes the company. They plan to retire some of the engines, and later develop new engines for some aircraft. Republic Airlines, looking up for the F-4B, is still in the air. E model, so that for a time both models will be in production at once in the expansion.



## The Effectiveness of Sodium Cooling



In considering factors which influence exhaust valve life, temperature is the dominant one. High temperatures sharply reduce the resistance to corrosion, distortion, and fatigue life of the first alloy steel. The effectiveness of sodium cooling in reducing valve temperatures is shown by the curves above, typical of recorded test data.

The curve "Effect of Fuel-Air Ratio" shows that as the mixture is leaned out to obtain maximum economy, valve temperatures rise. The curve showing "Effect of Engine Speed" indicates that temperature rises rapidly as speed increases.

Eaton engineers will welcome an opportunity to discuss the application of Eaton sodium cooled valves to engines proposed or now in design.

**EATON MANUFACTURING COMPANY**  
CLEVELAND, OHIO

VALVE DIVISION: 9751 FRENCH ROAD • DETROIT 12, MICHIGAN



**PRODUCTS:** Sodium Cooled, Poppet, and Free Valveless • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotax Pumps • Motor Truck Axles • Turbine Mold Core Iron Castings • Heater-Defroster Units • Seap Rops Springtines • Spring Wrenches • Cold Drive Steel • Stampings • Leaf and Coil Springs • Dynamic Drives, Brakes, Dynamometers



PAC engine overhaul means saving, saving power



PAC engine overhaul means more time between overhauls



PAC quality workmanship sets the standard of the industry



PAC testing methods mean increased efficiency of operation

## Engine Overhaul Efficiency...

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XP5Y-1 turboprop flying boat

## Convair's Turboprop Flight Experience

Operations with Allison 501 engines in XP5Y-1 and Turboliner summarized for benefit of other users.

Flight engineers with turboprop-powered aircraft in the United States has been rather limited. And yet, in spite of the lack of operational base, there has been no lack of interest in this new type of engine which promises to provide operational and flight characteristics of turbo-prop powerplants.

It seems to us that this is a breeze on a hot day to find a technical document which is based on honest accumulated flight tests, which says what is wrong as well as what is right, which tells the "acid secret" of the tricky operation with turboprops. And last week, the summer at one of the SAE's National Aeronautical Meeting sessions heard just such a paper.

Coordinated by the Aircraft Corp's manager of acquisition and flight R. C. Luciani and chief pilot E. D. Shattuck.

\* "Flight Experience With Turbine Propeller Powered Aircraft," E. C. Luciani and E. D. Shattuck, presented by convair at the SAE National Aeronautical Meeting, April 14-17, 1951, New York City.

have sampled the results of Convair's experience with the Turboliner and the XP5Y-1. The examples which follow are taken from or based on, their paper. Convair to Both—The basic power section and on both Turboliner and XP5Y-1 is an Allison Model 501 for last. This turbine is geared to a single section, last-bladed propellers per se, as the Turboliner through a 17.5:1 gear reduction. Two turbine are mounted through a single gear box to drive dual mainshaft propellers on the XP5Y-1.

The Model 501 power section includes a 17-stage, single-entry compressor, a set of eight circumferential chambers of the cylindrical through-flow type, and a four-stage turbine. The turbine drives the compressor by means of a splined coupling shaft. The power section drives the reduction gear assembly through splined shafts at the face of the overpropeller rotor assembly. Each power section and reduction gear assembly is composed of an independent dry sump oil

system. In both the XP5Y-1 and the Turboliner a common oil tank and oil cooler ties the independent oil system into a common tank.

The Allison propellers are controlled by a constant-speed electronic governing control coordinated with the fuel control through a single power lever. The electronic governing is used only in the flight range and is designed to give 4 deg per second blade pitch changes for small offspeed signals. Overprop protection is provided by a hydraulic trapping governor which automatically takes over if the electronic governor fails. The governor can change blade pitch angle at a maximum rate of 15 degrees per second. Additional overprop protection is provided by a delay in the fuel governor which can cut fuel back as much as 90% depending upon the amount of overprop.

Single Constant-Speed levers for each power section is installed in the cockpit and operates a continuously control on the power section. This control is then operated by the fuel control by an electric solenoid. The propeller actuator



Turboshaft, Allison's experimental turboshaft version of the Conquest line.

controls the blade angle in the region below flight governing. In the flight governing region the actuator (which propeller spinning speed through an other variable pneumatic). The electronic governor sends signals to a valve in the propeller control which in turn changes blade pitch to maintain constant speed. The constant speed is variable from 12,800 rpm, turbine speed at approach or flight idle, to 14,380 rpm at full power.

Below operation, after governing, and the propeller blade angle is controlled by the throttle position. At this time speed is controlled by a fuel governor. Since the governing governor must not be left while the engine is in flight, an operational idle stop is provided by the electronic manufacturer. This stop is not to be pulled until the engine is on the ground or airborne and then a pulled manually by the pilot on the XP5Y1 and electrically by a selector on the turboshaft. As governed idle or meet the blade angle for maximum torque and approximately constant thrust is set and turbine speed is approximately 11,500 rpm. As the throttle is pulled back, reverse blade angles are set until maximum reverse thrust becomes available at 0° throttle quadrant setting.

Feathering is provided from any throttle position by moving the propeller actuator electrically. Manual feathering is available in the event of electric failure.

► **Operation:** The operation of a turboshaft powerplant is considerably simpler than that of a reciprocating engine. A single power lever combines all the conventional engine controls including throttle, propeller, mixture, speed, and fuel control. The most important engine instruments required are tachometer, temperature, turbine inlet temperature, compressor inlet temperature, fuel and oil pressure, and reverse rotation control. The latter need has proved to be a valuable indication of important power section failure.

In the XP5Y1 the pilots are provided only with a tachometer and fuel and oil pressure gauges for early engine. The latter will be replaced with a temperature sensor turbine temperature can be limited by fuel control. The pilot is fully informed as power set point during take-off and the temperature is his only means for determining that turbine inlet temperature is not a true guide of power.

The flight engineer has a complete set of instruments, but his major concern is to monitor the engine torque adjustment as not normally made in flight. Normal engine run-up check before take-off is recommended. The flight engineer monitors turbine inlet temperature, turbine speed, and fuel flow during take-off and advance the pilot only if any exists in line.

Engine check-out before releasing the airplane for flight is also quite simple. The engine normally consists of a full-power check of fuel and speed schedules, an engine governor check, with electronic governor adjustment, an operational idle check of fuel and speed schedules, and a full reverse check. The whole procedure is simple, played in a matter of a few minutes after longer the oil temperature up to maximum limits.

Experiences to date show that design powerplant must be taken with helicopter to keep foreign material and water out of the turbine. Several companies have been severely damaged by foreign material. The propeller push on debris from the rotor and drive it into the inlet duct. When some reverse thrust on landing the XP5Y1, the propeller then throw water forward which enters through the inlet section and on into the inlet duct. On occasion dirt water can splash the turbine flame, resulting in a dead engine. This problem is being solved by adding a plunger chamber to the inlet duct system, designed to prevent both foreign material and water from reaching the power section.

► **Starting:** Take-Starting power is supplied by an A/Rewind on turbine compression of 35 hp which is started by an electric motor. Compared to the CFC drive an air starter mounted on the induction gas assembly. This starter gives the power section to 1100 rpm when operation occurs. The starter cannot exceed 5700 rpm as reached at which point the power section is able to accelerate itself to 11,000 rpm. On the turboshaft the propeller turns with the starter, but on the XP5Y1 the power section only turns and the propeller is engaged later.

Some difficulty was experienced at first with the CFC to the starter, but engine adjustments solved the problem and start has been improved and easier. Minor starting problems were originally experienced on the XP5Y1 which required two CFCs to be operating to get a clean start but these problems have now been solved. No concern with cold weather starting can be obtained in San Diego, but it is expected that reciprocating engine practice will be followed to a cold starting engine. It is not expected that cold weather system will be a problem. No hot starts have been experienced to date, probably due to the excellent fuel control during starting.

The initial test runs and early flight of the turboshaft engines were plagued with all the usual electro-mechanical faults of a brand-new type of engine.

It was soon found that ordinary Canada plugs were not suitable for the turboshaft over any long exposure. Reciprocating engines are usually equipped with standard plugs during long runs. These prevented the inlet from properly controlling the engine. After all non-standard Canada plugs were eliminated in favor of straight-through normal (standard) of the engine of any maintenance and essential Canadian plugs were subject to wear vibration resistant, equipment became quite reliable.

Early flight runs revealed failure

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governing speeds, due to temperature and pressure effects on electrical resistance of balanced circuits. This requires very careful balancing of compensating circuits below each bleed, and readjustment of resistors by the flight engineer during flight. Special rheostats were temporarily installed for the flight engineer, and a redesign of the governing system is now underway to eliminate this condition.

► **Throttle Locking**—It is extremely important that the propeller actuator truck throttle position be an exact schedule within narrow limits. This actuator is operated by an electric motor controlled through variable resistors and a microprocessor circuit using a potentiometer. This type of circuit involves electrical feedback and step changes in the propeller actuator motor which, added to the mechanical hysteresis of the coordinating control, caused relatively large differences in speed signals to be sent to the propeller control. All these conditions are now being corrected by the installation of a potentiometer actuator mechanically connected to the coordinating control, and by the substitution of direct resistance for the variable ones. Difficulty has been experienced in setting the hydraulic emergency governor. The emergency governor must start to open before 100 percent rpm. In order to restrict turbine speed to less than 105 percent rpm. The result is that the emergency governor is based at 106 percent rpm and setting take-off governing speed is a delicate operation. No delicate solution has yet been found for this problem.

Previously, a complex hydraulic system in the propeller control has not been experienced. This condition will be dangerous because a mechanical lock pit stop is not presently installed in the propeller. Such a mechanical stop is mandatory in turbine installations because of the high drag of the propeller and windmilling turbine at full blade angle at the propeller.

In spite of these difficulties, it has been found that the turbo-prop is an extremely flexible thrust-producing powerplant. Full positive thrust and full negative thrust are instantaneously available even with rapid variations of the throttle. When the control system is functioning properly, no ranging of power or speed is experienced when the throttle is rapidly advanced. Response to the throttle is immediate and smooth when accelerating after a missed approach. This is a plant improvement over the reciprocating engine which must be handled rather gingerly when accelerating from a power-off glide.

► **Flight Experience**—Class the electro-mechanical equipment was operating properly, it was apparent that turbo-prop controls affected cooperative water handling characteristics on the XPV-1 dur-



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A solid loading condition transmits directly to the installation of fuel pumps on a multi-engine airplane cause to light on natural drag and stall characteristics of the NPV-1. The airplane developed an almost uncontrollable tendency to yaw and roll when the throttles were reduced to operational idle and the speed was reduced. Figure 1 shows the sequence of events during a typical landing. Particularly noteworthy is the amount of left aileron and left aileron required to maintain straight and level flight. This plot shows the difference in propeller speed between the outboard nacelles and the resulting difference in thrust between these nacelles. It is interesting to note that outboard nacelles probably create abnormal moments of lift over the wing section behind a flap-pipe during propeller and engine loss of lift behind a drag-producing propeller stall tests at operational idle. This shows accurate unstalled lift coefficients for higher than calculated.

► Asymmetric Thrust—Figure 2 traces the output for asymmetric thrust to the fuel schedule required to maintain a relatively low turbine speed at operational idle. The fuel schedule is designed to prevent turbine speed from dropping substantially below 90 percent rated speed. Thus, when the propeller governor signals for any speed other than 90 percent at operational idle, substantial changes in power output occur. The effect of these power changes with turbine speed is traced later with terms of thrust in Figure 3. It can be seen that the throttles are reduced to operational idle at a speed of 240 mph at a normal approach and one propeller is governing at 13,120 rpm, and the other at 12,680 rpm; there will be asymmetric thrust of 5000 lb due to fuel schedule. Turbine speed difference represents only 10 percent rpm; the propeller governing problem can be appreciated. The fuel schedule between engines is also subject to tolerance, and when these tolerances are added to the effect of turbine idling, the condition shown in

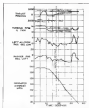


FIGURE 1: Landing sequence for the NPV-1 shows high degree of roll and yaw



FIGURE 2: Fuel schedule for the NPV-1 is designed to prevent turbine speed from falling below 90 percent rated speed



FIGURE 3: Thrust speed diagram for the NPV-1 shows governing difference



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FIGURE 4: Force vector acting on XFFYJ during asymmetric thrust.

In Figure 3 occurs. In this case, the full schedule was instantaneously set on the high side of the high speed turbine, making the asymmetric thrust to 3700 lb. instead of 8000 lb.

The present prop design provides for a hydraulic low pitch stop at approximately nine degrees, however, this blade angle is limited by the electronic governor which drives the propeller into a much finer pitch when the speed is off schedule. As can be seen from Figure 5, this feature aggravates the asymmetric thrust problem. If a symmetric perfect load scheduling for the right shown in Figure 5, the right outboard propeller will continue to increase due to the stepped drops, as shown by following the 15,120 rpm line. At the same time the left outboard propeller is producing thrust, as shown by the 12,000 rpm line. Now, if a mechanical stop is added at fifteen degrees blade angle, the right outboard propeller will be loaded to 3,000 pounds at 14.8 rpm, since lower rpm speeds will cause turbine speed to drop and drag to be reduced. At normal touchdown speed of 110 mph, the asymmetric thrust would be 1600 lb. If both propellers incorporated a mechanical stop at fifteen degrees blade angle, instead of 6300 lb. without the mechanical stop. This stop would have to be pulled out of the way after touchdown to prevent excessive thrust from backing up at the lower speeds.

Propeller synchronization should initially mask the asymmetric thrust problem, and will be discontinued at an early date. Any synchronization, however, will probably be unable to cope with large off-schedule drops of a tail fin-turbine propeller governor, as a mechanical low pitch stop is a must.

► **Blowout Hazard:** The hazardous nature of a turbine blowout was emphasized on one attempted landing of the XFFYJ. Just before becoming airborne, the plane moved violently to the left and the left wing pylon dropped in

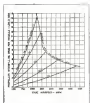


FIGURE 5: Winding diagram of XFFYJ needle can reveal thrust drop range.

to the water. The take off was aborted, and it was apparent that something was wrong in the left outboard specific. Examination showed the turbine wheel completely burned out in the left power section of the left outboard specific.

During the takeoff, the loading remained constant until bump speed was reached. Blade oscillation was normal up to that point to maintain a straight climb. An eight degree turn to the left was experienced going over the bump, which while unusual did not cause stress because a quivering wind was blowing. This was corrected by rudder and a nose heading was maintained. Then the aircraft turned to the left at about 50 mph and the turbines were all pulled back when the left turn appeared uncontrollable. Records showed that the left outboard engine started to fail at exactly the same time as the first going to the left. Turbine speed was not affected until the second swing to the left started simultaneously with a drop in turbine speed. It is presumed that the turbine wheel burned out completely at this point, and the drag of the compressor was so great that it not only choked off the horsepower from the other power section but dragged the propeller down as well. Analysis of the propeller speed and speed indicators that a burned out turbine wheel at take-off power causes at much or more drag as a propeller which is underloading both power sections.

A winding engine is a distinct possibility during takeoff or landing, and turbine blow-out has occurred at takeoff. Therefore a simple, reliable synchronization system is mandatory for both take off and landing conditions. It is believed that the best means of achieving this is to install a reliable tachometer to sense engine torque and initiate a propeller locking signal when it occurs.

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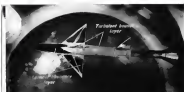
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flexible lead to extend up. Spring  
used with this thermocouple will  
assist its strength during high tem-  
peratures.

**AN104-1** Chromel-Alumel. Tail-  
type thermocouple. Insulated with  
a temperature resistant ceramic and  
enclosed with stainless steel  
sheath. This thermocouple is built to  
withstand severe jet engine service.  
We supply complete jet engine  
mounting brackets.

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ENGINEERING CO.**  
Manufacturers of Complete Temperature  
Measuring Systems for Aircraft  
HARTFORD, CONNECTICUT



## New Way to See Boundary Layer

How to see the invisible boundary layer on an airplane's shape is a problem which has been solved in several ingenious ways by mechanical engineers. Recently, the National Advisory Committee for Aeronautics has added another technique to those available for the visual study of boundary layer, and it promises to eliminate some of the shortcomings of earlier methods.

Most of these detection methods depend on the difference in temperature rates of liquids in laminar, turbulent and separated boundary layers. By setting a model and then passing air over it, the rates of temperature in the different regions of boundary layer will cause parts of the model to dry before others. By proper techniques, these dry parts can be seen or photographed and the pattern of boundary layer distribution detected.

**Chin-Clay Method.**—One of the best-known techniques for boundary layer observation is the so-called chin-Clay method. Here a suspension of chin clay in lacquer is sprayed on the model. When this dries, the model is evenly coated with a smooth white absorbent film. This film becomes transparent when sprayed with a volatile fluid with the same index of refraction as the chin clay. When the liquid evaporates, the chin clay again becomes visible.

An adaptation of the liquid film method has been in use at Ames Aeronautical Lab. The model is painted black first, and then coated with a liquid mixture of glycerine, alcohol and a wet detergent. Glycerine is the hydrophobic agent, alcohol is a solvent for proper spraying and the detergent facilitates wetting of the surface. Visual indication of the wet and dry regions is satisfactory, but photography requires that additional contrast be provided. To do this, the model is dusted with talcum powder, which adheres to the wet surface and blows off the dry ones.

**Luminescent Method.**—The NACA has developed with the aid of the Visual

Luminescence Corp. of San Francisco, a different technique which uses the use of a lacquer which has a luminescent pigment. This lacquer has the property of fluorescence only when dry. Any shape which has been sprayed with the lacquer and subjected to airflow, at first appears uniformly dark under ultraviolet radiation. As solvents leave the film and drying begins, the drying areas begin to fluoresce (see photo). The result, of course, is transient condition and in time, the entire body will be dry and will fluoresce.

In tests performed so far, the drying rate has been slow enough to allow ultraviolet photography and observation of the pattern. In some cases it has been possible to stop the wind-tunnel and measure the model to make detailed study of the pattern which persists in it as its solvent leaves.

A complete description of the technique, together with the necessary lacquer and pigment descriptions, has been published by the NACA as Tech Note 1263, The Use of a Luminescent Lacquer for the Visual Indication of Boundary Layer Transition, by Jackson R. Stiller and Ellis G. Stark, of the Ames Aeronautical Lab staff.

## France to Build Strut Engines

(McGraw-Hill World News)

**Paris, England.**—British Aeroplane Co. has reached an agreement with France's Societe Nationale d'Etude et de Construction de Moteurs d'Aviation (SNECMA) under which the French organization will manufacture Bristol Hercules aero engines, the company announced here.

The agreement covers the supply initially of substantial numbers of Hercules engines from Britain, while the new production line is getting under way in France.



Douglas C-124

North American AJ-1

Republic F-91

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**WING-FLAP ACTUATORS BY  
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These are some of the huge bolts that "lap their wings" with Western Gear master. Wing-flap actuators—small, precision gear units designed and built by Western Gear—are but one type of the mechanical-power-transmission products that are our contribution to the nation's fast, powerful air arm.

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Fairchild C-119

Cessna 200

Lockheed  
F-90

Cessna  
XP357.1



CYLINDRICAL CAGEP at key in Fielded Telecommunications Laboratory indicates

## High-Purity Polarization for VOR

Quality of signals from new cylindrical transmitting antenna eliminates aircraft attitude error.

An exceptionally high degree of horizontal polarization purity is the outstanding feature of a new type of VOR antenna being developed by Ford and Telecommunications Laboratories, Inc., research arm of the International Telephone and Telegraph Corp.

The antenna, a cylindrical array of rods and levers, is well conditioned and which can be installed rapidly and serviced easily. The addition of DME equipment, for which space is provided, makes the array a complete VOR (vertical omnirange) antenna.

Background—VOR (VHF omnirange) was standardized by the International Civil Aviation Organization as a short range navigation aid. In the United States, about 300 VHF omnirange stations are being operated by the Civil Aeronautics Administration.

Overrange compares the received phase of two audio frequency signals (one vertical, the reference phase), is added to all directions with a constant phase modulation. The audio signal is radiated vertically at a speed of 1800 rpm, so that at any constant bearing around angle the received signal varies in phase.

These two signals are compared at the receiver and the phase difference between them defines the aircraft bearing angle of the station. Or in another

case, it defines the radial location of the aircraft with respect to the station.

Both these signals are generated from a single structure which radiates an omnibearing of 360 degrees extending the signal to a solid from the hub.

Background—The new antenna array is highly referred to as a "cage" because of the antenna's construction. The antenna comprises a cluster of vertical rods divided by circular levers into two functional parts, three generally sections. The lower cage is the antenna proper; the upper cage is referred to as an extension.

Frame assembly is mounted on a central counterweight like three currently standard for VOR multibeam (70 to 150 ft diameter). Maximum height of the unit is about 15 ft.

Lower cage contains a small dipole mounted on a cylindrical section of tubing concentric with the main cage. This antenna provides the variable phase signal. The tubing is a housing for a synchronous motor (which drives the dipole at a constant 1800 rpm) and a rotating drive shaft which transmits VHF energy to the dipole.

A magnetic shaft which is mounted on the dipole shaft. This shaft provides the 70 rpm reference signal using a magnetic pickup arm on its rim.

By mounting a hub and dipole on the

same shaft, phase change between and cross phase and omnibeam phase signals is eliminated.

The reference signal is brought out of the bottom of the cage through a transmission line to the transmitter. Here it modulates the radio-frequency amplifier which supplies energy to the omnibeam antenna.

Circular Radiator—The omnibeam antenna is a circular dipole mounted above the dipole. This antenna emits the reference signal and transmits identification and omnibeam radio transmissions. Electrical coupling between dipole and loop radiators is chosen to be "special and north-south only."

Cage extension space is available for mounting a DME (Distance Measuring Equipment) and an X-band beacon antenna. The addition of the DME antenna makes the antenna assembly a complete VOR (vertical omnirange) antenna.

When the beacon is used, two vertical rods in the antenna cage are replaced with X-band wave modes for radiating the beacon. The DME antenna lead can be passed through any of the vertical rods. And other rods may be used to carry power lines for the structure lights which can be placed on top of the cage.

Pure Radiation—Present, advantage of the cage antenna is the purity of the radiated signal. There is such a high degree of horizontal polarization purity that an omnibeam aircraft attitude error is not present in flying a course. And these errors are significant when run is high in 5 deg. course loss time with other designs.

Attitude errors produce the phase error known as "pitching" because the radiated energy depends on the aircraft attitude. Pitching is primarily caused when a pilot is trying to fly a course. In banking flight the tail color shows the pilot that he is on course.

He looks off to fly the heading, but finds that his heading has apparently shifted. He then tries again to enter the course, gets a heading, but finds that his heading has apparently shifted. He then tries again to enter the course, gets a heading, but finds that his heading has apparently shifted. He then tries again to enter the course, gets a heading, but finds that his heading has apparently shifted.

There is a structural advantage, too. Without the cage structure, the rotating dipole would be about 6 ft long and difficult to install, maintain, or move. The cage dipole is only 10 ft long, and its electrical isolation efficiency is maintained. The cage acts as an electrical lens and reduces the physical size of the antenna by using this four-to-one.

Background—With the new cage antenna, there is a lot of the same-of-ambiguity over the VOR system. The omnibeam antenna will not

long back and forth when the plane is directly over the transmitter, but will stay divided if the pilot is flying east. If he is a lot higher, the omnibeam will show an area of ambiguity, but this will be only at short distances.

Physically, the cage antenna also shows advantages in handling, shipping and storage.

First, the unit is completely adaptable to existing structures, in any replacement antenna should be. It is a one-piece unit which can be installed in considerably less than 24 hours, can stand in the assembly period over a week. The center housing for dipole and cone wheel is removable from the cage bottom for servicing as replacement and no timing need be done above the counterweight.

Development of the antenna system done by Ford for the USAF Air Materiel Command at Wilton, Louisiana, recently located at Fort Monmouth, Red Bank, N. J. Ford is now in production for the Air Force on this new unit.

## Lockheed Builds Avionic Test Lab

Lockheed Aircraft Corp. has selected construction on a new four-story laboratory building representing a \$480,000 investment. The new research facility will be primarily for missile work.

Avionics research will be duplicated at Lockheed to solve problems of aircraft design which stem from the increased missile speeds and the increased quantities of noise and radar caused in military aircraft.

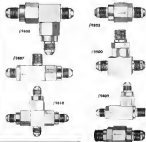
Laboratories and test equipment for missile research will be on the top floor and most of the new building. Augmenting these laboratories, a positive range for obtaining maximum performance will be erected nearby.

One line of the building will be devoted to an environmental test chamber to duplicate atmosphere possibly used up to altitude of 75,000 ft—where Lockheed says is the highest altitude ever simulated in laboratories. Temperature variations from -180 deg. F to 500 deg. F can be set in the test chamber, as well as a jet-propelled boundary, and spray, after which reduction of intensity such as atmospheric pressure, vibration, noise, wind, and dust.

Equipment used in conjunction with the chamber will test performance and stability of weapons under conditions of thermal shock, vibration, impact, acceleration and explosion.

The new laboratory is scheduled to be operating in the early months of 1952.

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ARO No.	Style	ARO Part No.	
6014-1	A	9709	
6015-2	B	9812	
6016-3	C	9814	
6017-1	D	9816	
6018-1	E	9735	

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## EQUIPMENT

*Exclusive Report on Postwar Airliners*

### Guide to Equipment Overhaul Times



North 242



Boeing Stearman



Cessna 441



Douglas DC-3



Lockheed Constellation

Equipment is working control of aircraft from now. It is essential to successful flight. And it is a big business. Maintenance and overhaul of that equipment is one of the airline's major concerns. Roughly 20 percent of all their expenses are in that category.

The airline knows equipment is important. They are examining its track record for equipment purchase as for vehicle purchase.

As a service to the industry, in response to repeated requests, Aviation Week presents the first and only correlation in any aviation magazine of the comparative overhaul times as known set by various airlines for similar equipment on all postwar transport aircraft.

• For airlines this special report can serve as a guide to better overhaul performance. There it needs to be learned from studying the discrepancies and consistencies in overhaul times for identical components mounted on identical airplanes flying identical routes.

• For airplane manufacturers this report serves to check let us how the equipment in their planes stacks up against that in their competitors' aircraft.

• For equipment manufacturers this report is a valuable index to performance of their equipment as installed in their own airplanes, and for comparison of their product with that of their competitors.

• For the airline services this report can serve as a useful tool based on the experience of commercial operators with equipment which the airlines also operate.

A lot of money can be saved if airline managements take a long, hard look at the comparative times of being about equipment overhaul times where practicable and desirable. Differences in operating conditions, overhaul facilities and maintenance philosophies are and do account for a portion of the variance in times shown in the report. But not for all of them.

Equipment is important airlines are almost or stretched to accommodate it. It can control an aircraft with greater precision than man. It is a lesser detective in flagging faulty components. If it fails, results can be fatal.

NOTE: In the report on the following pages, overhaul component data for all airlines operating similar equipment was made available because of the different methods individual companies use to present this material. The data are as complete as it was possible to make them. Some 30-40 more and would have been included by only one airline. This was made possible because of the fact that the overhaul times are not set by any one authority. They are set by the airlines. The following are the airlines that have furnished data: (A) - American Airlines; (B) - Boeing; (C) - Capital Airlines; (D) - Eastern Airlines; (E) - Frontier; (F) - Hawaiian Airlines; (G) - National Airlines; (H) - Northwest Airlines; (I) - Pan American; (J) - Republic Airlines; (K) - Trans World Airlines; (L) - United Airlines; (M) - Western Airlines; (N) - Western Air Lines; (O) - Western Air Lines; (P) - Western Air Lines; (Q) - Western Air Lines; (R) - Western Air Lines; (S) - Western Air Lines; (T) - Western Air Lines; (U) - Western Air Lines; (V) - Western Air Lines; (W) - Western Air Lines; (X) - Western Air Lines; (Y) - Western Air Lines; (Z) - Western Air Lines.

## Martin 2-0-2

[illegible]

## Boeing 377

[illegible]

## Convair 240

COMPONENT	SHEET			ASSEMBLY			COMMENT
	SER.	REV.	QTY.	SER.	REV.	QTY.	
FRONT PLATE	100	1.0	1.00	100	1.0	1.00	
REAR PLATE	101	1.0	1.00	101	1.0	1.00	
FRONT PLATE	102	1.0	1.00	102	1.0	1.00	
REAR PLATE	103	1.0	1.00	103	1.0	1.00	
FRONT PLATE	104	1.0	1.00	104	1.0	1.00	
REAR PLATE	105	1.0	1.00	105	1.0	1.00	
FRONT PLATE	106	1.0	1.00	106	1.0	1.00	
REAR PLATE	107	1.0	1.00	107	1.0	1.00	
FRONT PLATE	108	1.0	1.00	108	1.0	1.00	
REAR PLATE	109	1.0	1.00	109	1.0	1.00	
FRONT PLATE	110	1.0	1.00	110	1.0	1.00	
REAR PLATE	111	1.0	1.00	111	1.0	1.00	
FRONT PLATE	112	1.0	1.00	112	1.0	1.00	
REAR PLATE	113	1.0	1.00	113	1.0	1.00	
FRONT PLATE	114	1.0	1.00	114	1.0	1.00	
REAR PLATE	115	1.0	1.00	115	1.0	1.00	
FRONT PLATE	116	1.0	1.00	116	1.0	1.00	
REAR PLATE	117	1.0	1.00	117	1.0	1.00	
FRONT PLATE	118	1.0	1.00	118	1.0	1.00	
REAR PLATE	119	1.0	1.00	119	1.0	1.00	
FRONT PLATE	120	1.0	1.00	120	1.0	1.00	
REAR PLATE	121	1.0	1.00	121	1.0	1.00	
FRONT PLATE	122	1.0	1.00	122	1.0	1.00	
REAR PLATE	123	1.0	1.00	123	1.0	1.00	
FRONT PLATE	124	1.0	1.00	124	1.0	1.00	
REAR PLATE	125	1.0	1.00	125	1.0	1.00	
FRONT PLATE	126	1.0	1.00	126	1.0	1.00	
REAR PLATE	127	1.0	1.00	127	1.0	1.00	
FRONT PLATE	128	1.0	1.00	128	1.0	1.00	
REAR PLATE	129	1.0	1.00	129	1.0	1.00	
FRONT PLATE	130	1.0	1.00	130	1.0	1.00	
REAR PLATE	131	1.0	1.00	131	1.0	1.00	
FRONT PLATE	132	1.0	1.00	132	1.0	1.00	
REAR PLATE	133	1.0	1.00	133	1.0	1.00	
FRONT PLATE	134	1.0	1.00	134	1.0	1.00	
REAR PLATE	135	1.0	1.00	135	1.0	1.00	
FRONT PLATE	136	1.0	1.00	136	1.0	1.00	
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FRONT PLATE	138	1.0	1.00	138	1.0	1.00	
REAR PLATE	139	1.0	1.00	139	1.0	1.00	
FRONT PLATE	140	1.0	1.00	140	1.0	1.00	
REAR PLATE	141	1.0	1.00	141	1.0	1.00	
FRONT PLATE	142	1.0	1.00	142	1.0	1.00	
REAR PLATE	143	1.0	1.00	143	1.0	1.00	
FRONT PLATE	144	1.0	1.00	144	1.0	1.00	
REAR PLATE	145	1.0	1.00	145	1.0	1.00	
FRONT PLATE	146	1.0	1.00	146	1.0	1.00	
REAR PLATE	147	1.0	1.00	147	1.0	1.00	
FRONT PLATE	148	1.0	1.00	148	1.0	1.00	
REAR PLATE	149	1.0	1.00	149	1.0	1.00	
FRONT PLATE	150	1.0	1.00	150	1.0	1.00	

## Douglas DC-6

[illegible]



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## NEW AVIATION PRODUCTS



### Position Indicator

A new landing gear position indicator developed by the Kevoride Metal Co. puts that company, as the aircraft instrument manufacturing field.

The indicator for each landing gear has three easy-to-read, warning positions. Separate indicators activate the "up" and "down" flags appearing in the indicator disk to show above. When the indicator is triggered, an audible condition is indicated by a light with diagonal lines. Indicators are designed for mounting in banks of three, one for each wheel. Address: Kevoride, N. J.



### Hot Dimple Control

Latter hot dimple control on the market is the "Automatic Fingerprint Control" developed by Aerodyne Products, Inc., Chagrin Falls, Ohio. Kevoride, Kevoride, the company has patented the unit with two "hot dimple" double contact meter relays, one for each section of the die. Each has an built-in contact for registering heat of die and a long limit contact for safety shut-off. Controls permit adjustment to any setting through a temperature range from 150 to 750° F.

No wiring is used in the instrument. It is available as a single unit for control of individual dimpling machines or as a "Polypoint" model for independent control of a number of machines.

### Rugged Switch

Meltron Corp. reports it has developed a pressure switch with a non-damageous configuration which better withstands high frequency vibration or constant in vacuum aircraft and rocket engine applications.

Tests have shown, says the firm, that rigorous characteristics of the new switch, Model 750, "are consistent over a large pressure range than before. Also, design approach has made possible construction of a unit that is smaller and lighter in weight, it adds. The device is available with a stainless steel pressure sensing element for use with most engine liquids and gases. Address: 930 N. Highland Ave., Los Angeles 18.



### Speeds Wiring Tests

The time it takes to test multiconductor cables is usually can be cut down as much as 80 percent by using a new test set recently placed on the aviation equipment market.

That's the claim made by Welch Instrument Co. for its "Universal Cable Tester." The test, says the firm, meets specifications drawn up by the Air Material Command. It is specifically designed to check multiconductor cables used with aircraft radar, radio, lighting, instruments, control units and other equipment.

The test's effectiveness in cutting maintenance time and costs is well demonstrated in its use with the H-35. Working in this border, some can be checked out in eight to ten minutes at \$10 to \$20 required to do the job, asserts the maker.

Operation of the tester, a portable type, is said to be quite simple. Cables are connected, type of test selected, then each conductor is checked out as rapid sequence by forming a contact which readily indicates the conductor being tested.

The instrument is equipped with a pair of coiled cable connectors for testing RF and co-axial leads a pair of 47 contact connector receptacles and a pair of 35-contact connector receptacles.

For continuous testing, a full sequence is passed through the conductor. If



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The Flat-Top are on duty now—making possible service records. With these remarkable new tank trucks, Cities Service is fueling Eastern Air Lines planes at LaGuardia, Newark, and Boston's Logan Airport. Never before has there been any approach as the safe, speedy, convenient fueling now made possible by Cities Service Flat-Tops.

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# CROUSE-HINDS

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# WIND TEES

*Landing Direction*  
DAY and NIGHT



Remote Operator Control Panel



Crouse-Hinds Wind Tee

Crouse-Hinds Wind Tee serves as a continuous day and night indicator of wind direction and preferred landing direction. It can be standard, flash and simple wind tee responsive to the wind only or with continuous flash to make it completely automatic or controlled by a remote operator.

The wind tee gives the appearance of a single cross "T" when viewed from above at night and a single made yellow "T" when viewed from above in the daytime.

- Standard Free Floating Wind Tee:** Responds only to flow plus. Crouse-Hinds to meet CAA Specification, L-100.
- Standard Free Floating Wind Tee with Position Indicating Transmitter:** Responds only to flow at its desired position. Solenoid control system shows true position of the wind tee in actual terms.
- Wind Tee Complete with Automatic No-Wind Return and Position Indicating Transmitter:** Responds only to flow of the wind (preference) line velocity (actual velocity). The solenoid velocity is adjustable between 5 and 15 gals. When wind drops below the rated velocity, it makes automatically return the tee to the preferred no-wind position (usually the preferred direction as the largest or preferred runway). The preferred no-wind position is set mechanically on the base of the tee. The tee is held in the normal position until the wind velocity exceeds the rated velocity when it begins to turn freely with the wind. The tee is complete

with solenoid position indicating transmitter.

- Wind Tee with Operator Control and Solenoid Position Indicating Transmitter:** The transmitter to indicate special control when wind velocity is below rated velocity. When wind exceeds the rated velocity, solenoid is automatically disconnected from the circuit and the tee (flash) freely with the wind, preventing damage to the tee in strong winds. Tee is complete with solenoid position indicating transmitter.

- Continuous Wind Tee and Wind Tee:** It is always desirable to have a wind tee in position to a wind tee. The wind tee is extremely sensitive and indicates wind velocity and wind direction at all times. The column of the wind tee is continuously repositioned by the operator connected line and the no-wind return. If the wind drops and wind tee is not adjusted to wind when on the ground, the pilot's view of the tee is obscured by the wind and it is not visible. When the wind drops and is not at the top of the wind tee, a pilot can quickly and easily determine the true landing direction and also the actual behavior of the wind.

**Special Features:** A flashing transmitter and solenoid are added to the wind tee control to provide operation of the lights with steady flashing or flashing. Red lights can be hooked up in addition to the green lights on the wind tee, which is sometimes desired for better view.

Write for additional information.

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This most timely announcement caps the test program we started 8 years ago when silicone resins were introduced by Dow Corning Corporation. First we proved by accelerated life testing that silicone insulated motors had a good 30 to 50 advantage in life expectancy and test insulation resistance. Then we sold silicone (Class H) insulation to the manufacturers of electrical equipment ranging from 1/4 hp truck and traction motors to salinized and brake cars. We also encouraged the better reward shops to rebuild hard working industrial motors with Class H insulation.

Now we can proudly refer American industry to this quality lot of electrical manufacturers, all able and willing to supply electric machines protected by Class H insulation made with Dow Corning Silicones.

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\* "Class H" insulation is the kind of insulation that keeps motors running in spite of "Hot and High Voltage" - *Motorists' delight!*

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in Canada: Elcomex Canada Ltd., Toronto • in Great Britain: Michael Williams, Ltd.

line than 1 wing piece, a pilot light indicates "open circuit." A separate light indicates a closed circuit. In addition, standard checklocks, over-center clamps, but the one being tested is grounded and 1500v dc applied. Leakage is positively indicated. About once as measured is regular. The circuit is designed also for radiation breakdown tests, point to point check, out of any cable or part of the wiring circuit and under work.

The device has baggage type handle, weight 62 lb., measures 24x19x18 in. Mullen's address is 1221 West St. Cincinnati 14.

### Terminal Seals

To be stand of positive, permanent sealing of electrical terminals, used in the presence of parts or fluids. Franklin C. Webb Co. advises use of its rubber "Torrax O Seals."

They are designed to prevent entry or escape of fluids or gases, depending on the application. The sealing glands are made of neoprene for installations where temperatures range from -57 to 225°.

Silicone rubber is used for temperatures from 100 to 500°.

Torrax O Seals, complete with studs and washers, are available for high frequency applications and voltages up to 12,000v. According to the company, the method of sealing is based on the principle that rubber released from pressure tends to return to its original shape. Actually, the sealing gland is a rubber ring compressed into a square section. The resulting configuration creates maximum recovery tension with a new, round of rubber release, says the firm. Address: 467 Commercial Center North, Wichita, Calif.

### Packing Case Hooks

To speed loading of heavy items and to cut handling costs, Nelson Wheel Co. is marketing a lift hook which is built right into the packing case as a permanent fixture.

Now, instead of wasting time, laboring the load prior to lifting, the hook on the box can be attached to the hoisting sling immediately and the load rapidly hoisted away. Nelson says its hooks are the only ones "officially approved by the Air Force for engine packing cases."

Four hooks used for a single load are designed to lift 30,000 lb., says the company. General Electric Co., however, has established the loading point for a single hook of this type at 15,000 lb., Nelson says. They are made of alloy steel, heat treated and zinc plated. Address: 1614 N. 12 St., Milwaukee 5, Wis.

Finest Buy in the Land... on **Every Count!**

## NEW 1951 CHEVROLET Trucks

Advance-Design

These new 1951 Chevrolet trucks are tops in value. They're tough and rugged. They're loaded to the brim with power. They're thrifty... move massive loads... handle like no other truck. Chevrolet's latest leaders have 51's finest new features, too. Features like new, super-effective brakes that are extra-safe and easy to operate. Features like Chevrolet's Dual-Shoe parking brake. Chevrolet's new Vent-pneum and new cab seats that bring you comfort with a capital "C." With your Chevrolet dealer and look over these great new trucks. You'll find the right truck for your job!

CHEVROLET MOTOR DIVISION, General Motors Corporation  
DETROIT 2, MICHIGAN



### ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD PUMPS—the 1951's give you greater power per gallon, better fuel economy • POWER-JET CARBURETOR — for smooth, quick responsive response • DAPHA-BAR SERVO CLUTCH—for easy shifting, equipped • 1700-1900-2300 • TRANSMISSIONS—for fast, smooth

shifting • 1400-1900-2300 AXLES—for dependability and long life • NEW TORQUE-ACTION BRAKES—for light-duty service • POWER-DRUMMING BRAKES—for heavy-duty service • NEW 2300-ACTION BRAKE BRAKES—for heavy-duty service • NEW OVER-1900 PARKING BRAKE—for greater holding ability on heavy-duty

models • NEW CAB SEATS—for complete seating comfort • NEW VENT-PNEUMS—for improved air ventilation • NEW-GRAB WHEELS—for improved tire mileage • DUAL-TYPE CUBING—for extra handling • DUAL-DESIGN ROOF—for greater load protection • A DAPHA-BAR SERVO CLUTCH—for improved control and smooth operation





## TEMCO Modifies C-54 for Air Evacuation

Modification by TEMCO of the familiar C-54 transport into flying hospitals in the Military Air Transport Service is proceeding at top speed. Completed as the C-54B, it was developed for the rapid evacuation of sick and wounded personnel from overseas bases.

These planes were previously used as the Berlin Air Lift to fly coal and more recently to fly supplies to our troops in Korea. Designed to provide state-of-the-art medical facilities in our fighting forces in any part of the world, they can be quickly converted into troop or flight centers.

## Features Greater Comfort and Better Medical Care

Nothing has been overlooked to make these planes comparable to the finest hospitals. They are equipped with 1200 to 1500 beds of four each on each side of the fuselage. All of the floor is a gallery, a series of modern cabinets and complete toilet facilities. The ship is completely insulated and soundproofed with the outside top half of the fuselage painted with a special white heat reflecting white lacquer. Automatic dehumidification and a special oxygen system are significant among the many innovations that make for comfort in the new flying hospitals.

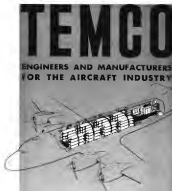
## Production Line Overhaul Is Unique with TEMCO

TEMCO has developed overhaul, modification and conversion as a production line basis so a plant where it is the country's outstanding source for this type of work.

Nearly five hundred Air Force Skyraiders have been overhauled or modified in the past two years. TEMCO's facilities have salvaged over 1000 parts unobtainable from regular sources. Many planes destined for the scrapheap have been reborn by TEMCO and put back in service.

## TEMCO to Manufacture Assemblies for Lockheed P2V Neptune

TEMCO has started work on an unprecedented quantity of major assemblies for an advanced version of the Lockheed Navy P2V Neptune patrol bomber. This is the plane made famous by the Navy's "Punchline" tactic.



## CONVERTS COAL CARRIERS TO

# Flying Hospitals

Hospital accommodations comparable with the finest medical institutions are now available for the care of sick and wounded military personnel anywhere in the world. Carefully designed for every comfort and care including such innovations as automatic dehumidification, the planes are capable of carrying 32 patients plus a medical crew of three. Formerly coal carriers on the Berlin Air Lift these planes are just a part of over 500 C-54's converted, modified or overhauled by TEMCO in the past two years.



Texas Engineering and Manufacturing Co., Inc.  
DALLAS, TEXAS

## Code Tape

Electrical wiring, tubing, hose lines, meters, spare parts and other components for aircraft can be conveniently identified through use of Lablon paint-on sensitive tape, made by Lablon Tape Co., Rochelle, N. Y.

Any part number or code designation can be written or typed on the tape below it is applied to the part to be identified. The material has "highly" writing qualities, depending only on pressure. A seal could be used, for example, to mark sharp colored numbers or lettering. This provides a label which cannot be affected by water or oil, that is a snap-on-good and resistant to acids and weathering, says the company.

The tape is designed to adhere at temperatures from -40 to 150 F. It is made of two types of acetate with a white, waxy substance and which between, and can be moved from one surface to another repeatedly without leaving a sticky residue or destroying its adhesive qualities, according to the maker. The tape is available in various widths and lengths and reportedly is being used in large quantities by the Air Force.

## Limit Drive Load

Type ATLC torque limit actuators now being marketed by Barber-Colman are designed to stop operation when load on drives past exceeds rated capacity.

These units are claimed to give positive, accurate positioning and are available with a wide range of gear reductions for loads up to 500 lb. Torque from a few degrees up to several hundred shaft revolutions is possible with no adjustment.

Designed to meet all applicable AN specifications, they can be supplied with various mounting arrangements in five, different types of drives and with or without auto reset. Write: Address Rotoraid, 31.

## ALSO ON THE MARKET

Angle iron guides, for standard "DeM" hand saws of 16- to 60-in. throat capacity, enable all models to cut work of as much as 15 in. diameter in any angle and down angle. Made by DeM, Co., Des Plaines, Ill.

Flex-type toggle clamp is hand tool designed to provide positive locking pressure with firm toggle locking action. Use has forged steel pins and handles, weighs 5 oz. Detroit Stamping Co., 303 Midland Ave., Detroit 3.

# TEFLON



## PRODUCTION



INTEGRALLY STIFFENED air machine, forged in one piece on Wyman-Gordon Co.'s 15,000-ton Mesta press, replaces part usually made of 25 individual pieces.

## Tests Show Value of Press-Forging

Lockheed and Wyman-Gordon complete preliminary study on forming integrally stiffened structures.

Lockheed Aircraft Corp. and Wyman-Gordon Co. have finished their 18-month development contract calling for preliminary investigations of press forging methods of manufacturing integrally stiffened structures. Now they are agreeing for a contract to study the method further.

William Schneider of Lockheed's engineering staff tells Aviation Week he is confident present work can be improved greatly with additional research and more and bigger machines. Next all the problems of press forging are yet unsolved.

Need for Bugeye-Machines are the next pressing problem. The only one close big enough to press large parts is Wyman-Gordon's 15,000-ton Mesta (The Germans used a 30,000-ton press.)

Bigger machines will be forthcoming under Air Materiel Command's heavy-press-forging program at Adams, Mich. The progressive program calls for several 25,000-ton and 50,000-ton presses and a giant of 75,000 tons in the neighborhood of 55 million, and construction probably in several years away.

When these machines are built and the press-forging process perfected, Lockheed engineers think integral stiffened parts can be press forged in sizes up to about 8 x 10 ft.

What's Being Done—That is the story of Lockheed and Wyman-Gordon's program to date.

When they started two years ago, the forging of integrally stiffened structures seemed highly impracticable because of

the extremely thin skin thickness required. First trials consisted of forging panels two feet square from round bars. These trials resulted in failure of the dies by delamination. Next, plate forging in thickness from 8 to 4 in. was pressed and final skin thickness of .005 in. reached.

Other trials consisted of attempting to press the typical panel to that proper thickness but because of the lack of sufficient pressure it was not obtained. For example, a 148 plate, 36 in. thick, was pressed to a skin thickness of .150 in. Ultimately a 6-in. sheet was perforated to desired shape, then in the final forging operation reduced to .143 in. with vertical legs as much as one inch in height. Stiffest panels attempted were about 3 x 6 ft.

Power Problems—The first big problem the engineers bumped into was the tremendous pressure in press forging—which proved much greater than any one imagined when the program was begun. This was another reason for accelerating the Adams program.

The other problem was that of the die and bed delamination which resulted in some serious skin thickness. This has not been satisfactorily solved yet, but Schneider points out the process is just in its infancy.

For the moment, Lockheed believes it is more economical to forge flat than to finish machine. One reason is that forging dies that don't produce a part to finished contour are more expensive than dies producing only a flat blank. Also in long as the non-uniform skin thickness problem is with the press-forged parts are going to require considerable machining.

The problems of machining for desired accuracy at joints and other at midlines would be difficult in a bonded part than in a flat. Also, press-forged parts require a certain amount of machining under no circumstances, in with all forging processes. With better press-forging methods, less machining will be required.

Flat Forging—Fortunately the strong aluminum alloys such as 7050 and 7055, as well as the titanium in service, titanium, lead themselves well to hot forming techniques. And, by hot forming, heat and heat treatment and spring back are eliminated. Tighter bends are obtained with a corresponding reduction in weight and for the very noticeable time allows, the tendency to crack is avoided.

Lockheed learned that press-forged parts, like other types of integrally stiffened structures, are considerably lighter. A typical wing panel weighing 75 lb in conventional construction weighs only 55 lb as an aluminum after forging. If forged from titanium alloy, weight would be 46 lb. With present exploitation of the press forging



## JOY AXIVANE AIRCRAFT FANS warm airborne troops before take-off

To protect our airborne troops in flight areas before take-off, Joy AXIVANE Aircraft Fans are installed in these large troop-carriers to blow heated air into the room when the plane is on the ground. Heat effect is utilized for this purpose after the warmer air is blown. Air from the fan is mixed with a heated series of air from the house to provide the desired air temperature in the room. Thus, cold weather is no hindrance to the fast, efficient transportation of our fighting men to any theater.

This highly-efficient 1.5 H.P. fan produces 1100 C.F.M. at 5.5" static pressure, yet weighs only 22 pounds and is only 5'6" in diameter. A & N design specifications. Superior features of all Joy Aircraft Fans are compact design, shock-resistant strength, minimum operating noise, and the most favorable air volume-weight and electric-to-air power ratios.

• Joy designs and builds both fan and the power equipment for which it is required. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes much heat can be supplied from the extensive heat already designed. Such engine and fan range units are available. Optional features include straight or flared inlets, heated or flanged connections, rubber-overs filters, autocontrols, and control motors where required.

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Here are some of the many uses for Joy AXIVANE Aircraft Fans: Windshield de-icing, windshield or wing de-icing, cabin heating, cabin venting, cockpit heating, cooling radio and electronic equipment, cooling vehicle regulators, oil cooling, gun-bar cooling, instrument cooling, air conditioning, and high-altitude pressure chamber heating.

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*Control a Joy Engineer*  
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W-10-1045

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- DURABILITY

This compact, high strength latch means a high number of all them and is usually single in operation. There's no tie line parts, just a bearing and a single assembly.

There's more convenience allowing removal from 21 inches diameter to 48. Suitable for either hand or automatic operation. Positive safety latch. But here's the real reason for latch choice.

The Simmonds High Strength Cowling Latch weighs from 6 to 8 ounces and carries an ultimate load of about 2500 pounds for tension and 5000 pounds in shear.

Although designed for engine cowling latches, this torque device is finding practical application in many doors, access panels, instrument compartments, gun turret openings and other places where high strength latching is required.

Our engineering and development division is ready to study your aircraft latching problems and adapt this product to your standard or special requirements. We will be glad to send complete details and specifications.

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# "S" MONEL

**A casting alloy offering extra hardness at elevated temperatures, pronounced resistance to galling and seizing, and excellent corrosion resistance.**

One of the hardest and strongest of the non-ferrous casting alloys, "S" Monel is particularly suitable for parts subject to high stress and severe friction under corrosive conditions.

"S" Monel's low coefficient of expansion, high density and corrosion resistance enable it to give excellent service where clearances are small and operating temperatures subject to considerable variations.

The principal characteristics of "S" Monel are:

#### Typical Applications of "S" Monel

valve discs	loadings
valve seats	shafts
impellers	explosion needles
water rings	direct acting pump levers

#### Mechanical Properties of "S" Monel<sup>1</sup>

At room temperature	
Tensile Strength	80-112,000 psi
Tensile Strength	120-140,000 psi
Elongation in 2 in.	4-15%
Hardness (Brinell)	300-375
Coefficient of Thermal Expansion (23-312 F.) in in. F.	0.000066

#### Hardness of "S" Monel at Elevated Temperatures<sup>1</sup>

Temperature, °F.	Brinell Hardness
Room	321
700	321
800	311
900	311
1000	321
1200	321
1300	273

<sup>1</sup>Always properties will be used for specifications

**Hardness:** "S" Monel can be age-hardened to 300-375 Brinell. It retains this hardness even at elevated temperatures. (See table.)

**Resistance to Galling:** "S" Monel is superior to most other hard metals in its ability to resist galling under severe conditions of pressure and friction. Often where lubrication is poor or absent entirely, "S" Monel has shown unusual resistance to galling.

**Corrosion Resistance:** "S" Monel is relatively unaffected by most commonly-encountered corrosives—reducing acids, organic acids, acid and neutral salt solutions, strong alkalis, dry gases, and moist atmospheres.

**Wear Resistance:** Because of high hardness and toughness, "S" Monel resists "scoring" caused by cavitation, erosion, "wire drawing," and particle abrasion.

**Machinability:** "S" Monel can be machined as-cast, and preferably so when only a moderate amount of machining is to be done. For extensive machining, the castings may be softened to 335 Brinell by heat treatment. Subsequent heat treatments can restore hardness to the level of 300-375 Brinell.

**Weldability:** "S" Monel is not recommended as a weldable material.

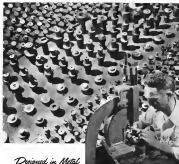
#### Additional Engineering Data Available

If you think that a corrosion-resisting casting might solve one of your operating problems, write to Inco's Technical Service Section, outlining the problem. They will help you in every way they can.

**THE INTERNATIONAL NICKEL COMPANY, INC.**  
47 West Street, New York 14, N.Y.

**NICKEL AND ALLOYS**

INCOLOY - "N" MONEL - "K" MONEL - "S" MONEL - "C" MONEL  
INCONEL - 700 CHROME-NICKEL - INVAR-NICKEL  
INCOLOY - INCOLOY "A"



*Designed in Metal*

## TO GIVE YOU SAMPLES *before* BLUEPRINTS

Every new **SPEED NUT** design is worked out on manual presses to provide samples for testing and approval *before* blueprints of the part are drafted.

Some new time-savings begin early. Experimental samples are made faster because Tinnerman engineers streamline the design process.

A design manual is covered with only a rough sketch as a guide. Then that pattern, bend, turn and offset from thousands like those illustrated above. These are set up in a series of manually operated presses to shape, bend or thread into fastener engineers for specific housing functions. The samples produced are accurate prototypes of the finished fastener, and can be used for mock-up assemblies.

These parts are then tested and approved by the customer before blueprints are drafted and the faster a per unit production.

In time like these, high-speed turner engineering saves valuable production hours and profit dollars. Proof of Tinnerman's ability to serve you is outlined in a new 38-page booklet, "A Story of Quality." Write for your copy: **TINNERMAN PRODUCTS, INC.**, Dept. 15, Box 6688, Cleveland 1, Ohio. In Canada: **Dominion Fastener Ltd.**, Montreal Distributor: **Art Associates, Inc.**, Scarborough, New Jersey.

**TINNERMAN**  
*Speed Nuts®*



FASTEST THING IN FASTENINGS

passive several years away, Lockheed is going ahead with other methods of making the integrally stiffened structure, particularly relying on a machine Lockheed plans to spend between \$150,000 and \$400,000 for one machine to seal wing and fuselage skins with surface fasteners from aluminum billes.

Present Unit-ite additions, Lockheed is increasing greatly its application of integrally stiffened structures. The F-54C will have the integrally stiffened panels from the leading edge to the fuselage and from the spot in the wing well section of the wing. The new Conquest will have all the assembly lines used will employ integrally stiffened skins over most of fuselage area.

As another example, the Mustang is being put another 1800 lb. of aluminum skin on the P-51. That means Lockheed engineers will have to turn the weight out of the structure of the engine, and that of course calls for more weight-saving integrally stiffened structures.

## Reynolds To Manage Adrian Pilot Plant

Management of the \$20 million project to build USAF Manufacturing Methods Pilot Plant, Adrian, Mich. has been taken over by Reynolds Metals Co. from the Gentry-McIntosh Co. The facility, which will be operated by Reynolds as a public, nonprofit plant, will be used for developing forging and extrusion techniques and the proving of theoretical designs in light metal parts for aircraft of advanced design.

Facilities at Adrian have already been used to work out problems of a number of large firms. One recent instance was the experiments of Curtiss-Wright conducted there on extruded hollow steel propeller blades (AVIATION WEEK, Mar. 19).

Equipment already in the plant consists of 11 hydraulic presses, one of 5180-ton capacity. Others include three 3550-ton, three 1750-ton and four 1020-ton presses. Now being installed are four forging presses brought from Cleveland, formerly belonging to the J. C. Farber Co., one of which has a capacity of 11,000 tons. The others are of 7000, 2800 and 600-ton capacity.

## California High In USAF Awards

California was very not in front of every other state in winning competitive and cost-effective USAF contracts awarded between Nov. 15, 1950 and Feb. 15, 1951, as listed in the quarterly published quarterly, U. S. & World Information.

The aviation section is listed as having

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CONVAIR  
**B-36**

by  
**Swedlow**



The Consolidated-Vultee B-36, world's largest bomber, can carry a heavier load of bombs for a greater distance at a higher altitude than any other aircraft in existence.

This superlative weapon in the arsenal of democracy is a masterpiece of precision manufacture. Every component part must achieve a peak of perfection worthy of the great role the Convair B-36 is to play in our armed forces.

SWEDLOW was selected to produce the laminated acrylic radome for the B-36 because of a 15-year record of leadership in acrylic fabrication, specializing in strength applications for the Air Force and Navy of the United States.

- To also serve the industry with improved fuel cell bakings in accordance with applicable Air Force, Navy and customer specifications.

gotten \$395,832,876 as AF awards, second-up being Michigan (\$93,266,693) and New York (\$35,237,796). New York, however, was credited with the largest number of announced contracts, 173, with California and Ohio trailing with 135 and 101 respectively. A total of 21 states are listed in the directory as having gotten no competitive and unclassified USAF contracts in this period. Four of the states—Arizona, North Dakota, South Dakota and Wyoming—did not participate at all in the announced awards listing.

Announced USAF contract awards in order of total dollar values are as follows:

- Calif., \$195,832,876
- Mich., \$103,266,693
- N. Y., \$101,237,796
- Ohio, \$137,228,891
- N. J., \$11,589,895
- Ind., \$10,440,581
- Pa., \$7,448,715
- Ky., \$6,263,118
- Mo., \$6,114,175
- Conn., \$5,689,901
- Ill., \$5,401,116
- Minn., \$5,382,096
- Md., \$5,687,231
- Wis., \$5,245,835
- Neb., \$5,794,217
- Wyo., D. C., \$1,808,154
- W. Va., \$179,378
- Ky., \$164,056
- E. I., \$144,695
- W. Va., \$179,378
- Neb., \$526,313
- Ohio, \$521,794
- W. Va., \$441,564
- N. C., \$95,371
- Iowa, \$91,139
- N. H., \$81,715
- Va., \$60,021
- Del., \$44,261

## Boeing Plans More Equipment Spending

Boeing Airplane Co. will spend \$1.5 million for new machinery and equipment at its Seattle and Renton, Wash., plants, in addition to orders totaling \$4.5 million already placed for machinery, tools and mobile equipment, President William M. Allen has announced.

New buildings may be required to house some of the equipment. The Aerojet Co., engineering and construction firm which built Boeing's main Seattle plant, is conducting surveys in conjunction with Boeing's plant engineering department to determine the building needs. The firm has begun construction of a flight test station at Boeing Field across the street from its main Seattle plant.

The expansion program has been brought about by production orders for two B-72s and the acceleration of work programs already under way,

# Jet Compressor Parts



Above: Compressor blades for turbojet and turbofan engines. Robbins Engineering specializes in the production of rotor compressors and complete rotor assemblies.



Above: Complete rotor assembly for turbojet engines, manufactured by the Robbins Engineering Company.

## Machined and Assembled to Rigid Specifications

The machining of jet compressor parts and the assembly of complete rotor units require an organization having specialized tooling and inspection equipment and plenty of aircraft know-how. Turbojet engine builders are enthusiastic about the work of the Robbins Engineering Company, a subsidiary of Ex-Cell-O Corporation.

The Robbins organization is expending wholeheartedly with the program to build up air power for the defense of our security. All its efforts will be directed toward this and in the present emergency.



**ROBBINS ENGINEERING COMPANY**  
Subsidiary of

**EX-CELL-O CORPORATION**

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**PLASTICS CO.**

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Whether the system requires Vapor's basic Mercury Tube or the more critical Electronic controls, Vapor engineering offers the only advancement in controls... Smooth Pulse Modulation. Through current applied intermittently to the actuator, "Smooth Pulse" action on valves and actuators insures longer life and dependable, trouble-free service.

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INDIANAPOLIS - INDIANAPOLIS - LOS ANGELES



Write for detailed information and descriptive literature:  
 ☐ CASH TEMPERATURE CONTROLS, Bulletin No. 340  
 ☐ CUMULATIVE TEMPERATURE CONTROLS, Bulletin No. 219  
 ☐ ENGINE OIL TEMPERATURE CONTROLS, Bulletin No. 242

Name  Title   
 Company   
 Address   
 City  State

Allen and These programs include the production of B-26 and C-47s and the modification of B-26 and B-24. The present modification contract is expected to be completed by June but new orders are expected.

Deliveries on equipment standby as ordered will begin in April. Some of the 4000 machines and tools on order include a 7000-ton hydro press costing \$130,000, a horizontal Keller rolling machine, 7x16-ft., \$114,000, an automatic lathe to handle sections up to 16x12-ft., \$180,000, equipment to hot form magnesium, \$67,000, spin cap rolling machine, \$100,000, automatic control rolling machine, \$90,000, two 35-ton averaging bridge cranes, \$47,000.

### Ordnance Exhibits For Industry

Taking its cue from the highly successful contractors exhibit the USAF set in New York during February to attract small business firms who export defense subcontracting (AERONAUTICS WEEK, Mar. 5). Army Ordnance is setting up associated similar displays at its 15 offices throughout the country.

Ordnance exhibits will include samples of representative components of ammunition and other material; display bombs, photos and other material; case-study information pertaining to Army, military needs.

A further purpose of the shows will be to emphasize that Army contracts are negotiated in the District offices and not in Washington.

### PRODUCTION BRIEFING

► **Atropine Corp.**, Jackson, Mich., has purchased all the outstanding stock of one of its industrial subcontractors, Mettich, Inc., also of Jackson. The new acquisition will continue as a subsidiary. The parent firm is negotiating for lease of a larger plant in Chubbuck, which will house that triple parent Mettich four space.

► **Boeing Airplane Co.** employment in its Renton and Seattle plants has passed the 75,000 mark, with a continuing need for many tool designers and production planners. Paul & Whitney has hired a 30,000 worker, a more than 2000 percent in the past 12 months.

► **Ontario Hughes-Owens Co. Ltd.**, has been purchased for over \$1 million by Sperry Corp. of New York and its Canadian subsidiary, Sperry Gyroscope Co. of Canada Ltd. The facility will be used for sales, service and repair of



Head light, Kildare, the safety boys are at it again, and so is our looking glass of trust!

# The Birdmen's Perch



This case it's a shoulder business, these vigorous birds desert that keep a pilot from diving up like a Polar House Roll if he craves.

Save your safety belt and reduce the danger of an accident, but you hold a confidence shoulder between when it comes to overall protection.

Now, for a moment you're coming to for a small leading winging a shoulder business. Gosh, watch that knee, look out for those other legs!

See—what do we tell you instead of looking up like a two-bit pickpocket, you just see there and let the heavens color up.



most of the shock. And worse, twice, you land a bill against the rear instead of bumping against the summer pool. Hey, Zerk, speak to me!

But all kidding aside, should it be so easy to reduce the intricacies of a good many things?



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the company's products in Canada, along with Lewis and Robinson products.

► Lockheed Aircraft Service's facilities at Burbank, performed 241,366 work hours on 352 aircraft last year, with military work accounting for 65 percent of the total.

► Madsen Co., Inc., Los Angeles, sheet metal workers, is adding up a Metal Working dream to contain 10,000 sq ft for handling aircraft subassemblies in stainless steel, aluminum, aluminum alloys and magnesium parts and sub-assemblies.

► North American Aviation has set up an "iron while you learn" school in Inglewood, Calif., to indoctrinate new engineers in aircraft procedures. The school can handle 70 students every three weeks. NAAV's expanding staff numbers 4500, highest in firm's history.

► Warner Division of Clinton Machine Co. has completed new manufacturing facilities for hydraulic units at 2133 Confront Highway, E. Detroit, Mich.

► General Aircraft Supply Corp., Detroit, has added 5000 sq ft to its warehouse facilities at Detroit City Airport.

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**TO WHAT ENDS?**—Dolnos Vos Flages reports CAC's Harold Hackett's stock reply to inquiries as to advisability of changing our national administration: "It is ALWAYS best policy to change horses or men out from under in midstream."

**ON RYE OR ALCLADO**—Dr. Van Flanagan says Stan Yackel, Chairman of the ANC-23 Board, plans to send several copies of the new ANC-23 bulletin, "Standards Coordination," to CSI. For those who haven't been writing their alphabet soup lately, CSI means Government Services, Inc., the outfit operating the government exchanges.

**NNA KNOWS HER PENTAGON**—Discarding "secrecy" in Washington, as always, we caught Assistant Defense Secretary Anna M. Rothenberg's pious protest that the Pentagon isn't happy. She said, "I think one name she wouldn't give them today [except Roger] might be the word 'classified.'"

Charles Carl Vance and they'd been pushed to hand over it. Mrs. R. sighed and said, "Sometimes I think we classify last week's newspapers." Mrs. R. wasn't so far wrong. Sometimes the Pentagon lets its press and its contractors to withhold even material that has already been published abroad.

**TELEVISION IS CHEAPER**—Jerry McIlwain, Lockheed chief structural engineer, told Van Flanagan recently while discussing proposed cabins and cabin window requirements: "We could build 'em cheaper, lighter, and stronger if we could leave the windows out entirely and install television sets instead."

FROM THE SOLID SOUTH—A certain scornful cynicism is Atlanta, according to Von Flagen, has a favorite saying: "Things wouldn't be like this if Truman were only alive."

**BEHIND THE HEADLINES**—Sometimes we like to give you readers a glimpse behind the Arcazone Wren headlines so you'll be glad you aren't editors. A strange sounding news story washed up on shore our correspondent in Colombia. We held up the story and asked for a further check before printing it. The McGraw-Hill World News Bureau did check and reported back to us.

"The comrade" writes that he got it from an official on the Colombian equivalent of the CIA who got it from Lasso's president. He also says, "When I checked at Lasso's affairs recently they told me something was waiting but they doubted very much that [Lasso] would invest money in Lasso, having the opportunity now to establish their own lines to Colombia. But when we discussed the matter here he did not actually deny my information though it sounded rather fantastic to him." (Defence answers: That's what we like.)

**A NEW DEPARTMENT—**Aviation Week's Equipment Editor, George Christen, tips on his return from Florida that Fowden is going about efficiently labeling all its departments with succinct three-letter initials. The Miami Orpheus Base becomes MOB, Component Orpheus Base becomes COB. One straightened PAA. Need a more accurate abbreviation of a South Orpheus Base.

NO PLANE SHOULD BE WITHOUT ONE-G-G Stronger, the hydroplan specialist, tells the crew about a fellow he knows. It seems the chap had been flying on surplus in which the airport and altitude indicator behaved quite erratically in certain circumstances. The unsatisfactory condition had been eliminated by modifying static vents and the gentlemen was duly impressed with the value of this information. Some time later, the same fellow was discussing an altitude malfunction with a pilot at an airfield. The fellow, who was a pilot, informed that the altitude control was causing difficulties, he suggested that static vents be installed. When he returned to his airfield he received a call from the experimental station. Someone tried to know just what had been said and was told: "Being a reasonable fellow, I just asked them to hold the line, went to the telephone and called G.E. to find out."

**ELECTION REPORT**—Gonzie Hoffman, in Atlanta, noting that we still haven't commented officially on last November's election, says he regarded the results with mixed emotions. Says he, "It's like seeing your mother-in-law drive over a cliff in your new Cadillac." —B. H. W.

## WHAT'S NEW

## New Publications

**Recent Developments in Visual Low-Approach and Landing Aids** for Aircraft is a 19-page digest by author Dr. Massimo A. Garbini covering observations and activities at the Air Force/Navy Civil Landing Aids Station, Anacostia, Calif., and of European and British experiments. Briefly covered are the methods employed in the flight tests at Anacostia of various landing systems, Garbini's conclusions, and some new methods of meteorological measurements suggested by FAA Captain Howard Coor for low ceilings at night.

Write the Garbell Research Foundation, San Francisco, for copies. Price is 60 cents.

A compilation of traffic, operating and financial coverage on all U.S. certificated airlines is presented in the current edition of *World Airline Round*. In addition, for the first time, data on foreign airlines is also included (but is not as extensive as that for U.S. carriers). This is a handy reference manual for airline executives and others desiring background information on the industry. Published by Ray R. Knaack, 100 S. LaSalle St., Chicago 4 • Price \$9.95

## Telling the Market

**Latent variables on portable light** and power assemblies with parts descriptions and ordering numbers on hundreds of combinations can be obtained by writing DEX G-39, by Mailbox 100, to the following address: Mr. J. H. Kuehn, 221 N. Lincoln St., Newburgh 22, New York. Two films on aviation are featured in the 1953 catalog of film strips and films being distributed by Civil Aeronautics Administration, Division of Aviation Information, CAA, Washington, D. C. **Eligible booklet on aircraft stress**, including a condensed listing of the essential features of the design of aircraft structures, is available from the National Aeronautics Administration. Specifications and design many of the A.N. Federal and Aeronautical Material Specifications pertaining to steel, and the recent corresponding AISI analysis. Write Joseph T. Spencer & Co., 1000 N. 17th St., New York 1, New York.

General, technical and design data for peristaltic livestock mixings is available for engineers and designers, detailing costs, tooling, large and small quantity production, handling of complex shapes, size limitations, finishes and tolerance. Write: Hitecort, Manufacturing Co., Inc., Minneapolis, St. Paul.

## ADVERTISERS IN THIS ISSUE

AVIATION WEEK—APRIL 23, 1963

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puters make the defensive counterpunching faster and more accurate.

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